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ment lower concentrations than those recommended by Löhnis developed protozoa in a shorter period of time.

(4) 3% chicken manure is an excellent medium for the development of small ciliates.

(5) The numbers and species of protozoa which can be obtained from a given soil are largely dependent upon the media employed, time of incubation, as well as the kind of soil used.

(6) In general the order of appearance of protozoa was as follows: small flagellates, small ciliates, large flagellates and finally large ciliates. This is in accordance with Cunningham and Löhnis' observations.

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*Note: Further results on experimentation and a complete bibliography on soil protozoa and soil sterilization are awaiting publication.

THE PRESENCE OF ACIDOPHILOUS CELLS IN THE ADRENALS OF CERTAIN AMPHIBIANS*

By Thomas Byrd Magath

The *adrenal glands* of the *Amphibians* vary, in color, from a light yellow to a golden reddish-yellow, and extend along the ventral side of the kidneys in a thin band. The function of these ductless glands is not definitely known, altho it is known that an injection of "adrenalin" will considerably increase the blood pressure and that the removal of both glands will result in death, as does an overdose of the extract.

Stilling found in the study of the adrenals of the Rabbit, during the summer, some remarkable cells which stained an intense red with eosin and appeared very granular in structure. He also found cells in *Rana esculenta* which had the same appearance and stained like those in the Rabbit; because of their appearance in the summer he called them *"Summer cells"*.

Patzelt and Kubik, however, found these cells all the year round and because of their affinity for acid stains called them *"acidophilous cells"*. The result of their work is as follows:

(a) There is present in the adrenal glands of *Rana esculenta*, as in the case of Mammals, Birds and Reptiles, two kinds of cells, viz., an epithelial portion and a *chromaffine* portion. The chromaffine portion is made up of large granular cells which turn a brownish-yellow when treated with chromic acid or its salts.

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*Contributions from the Biological Laboratory, James Millikin University, No. 12.

(b) The epithelial portion embraces the common *lipoid-containing* cells, and among these large granular acidophilous cells.

(c) The acidophilous cells appear all the year round and are stainable. They do not change with age, sex activity or nourishment.

(d) These cells are not present in the adrenals of other Anura, Urodeles, or Reptiles.

(e) Acidophilous cells appear in some other glands of internal secretion.

The author, with the purpose of verifying the above results and if possible of extending them, has made a study of the adrenal bodies of five Amphibians, viz., *Rana pipiens, Rana clamata, Spelerpes bilineatus, Acris gryllus,* and *Plethodon glutinosus,* several animals of each species, being used. All of these are different species from those used in the study made by Patzelt and Kubik. It is found that acidophilous cells appear in *Rana pipiens* and *Rana clamata,* as well as in *Rana esculenta,* as reported by Patzelt and Kubik.

The microscopical technique was on the whole the same as used by Patzelt and Kubik, and is given below. The tissue was fixed in potassium bichromate-sublimate-formol, from four to eight hours.

65 cc of 3½% aquous solution potassium bichromate;
35 cc of 5 % aquous solution mercuric chloride;
100 cc of formol.

The tissue was embedded in paraffin and sectioned five μ thick. The best staining was accomplished by hæmatoxylin and eosin. Sections were stained for fifteen minutes in hæmatoxylin and for from one to four hours in a very dilute aquous solution of eosin. The acidophilous cells stained an intense red with eosin, which showed their granular appearance. These cells stained a reddish-violet with the Ehrlich-Biondi triacid stain; indeed they stain with all the acid stains. The chromaffine cells stained a reddish-yellow, due in part to the chromic salt used in fixing. Another stain which was used with good results was iron-hæmatoxylin. The acidophilous cells stained very darkly. The granules stained a deep black while the protoplasm stained a dark grayish-blue. The chromaffine cells stained dark grayish-blue and the lipoid cells, black-gray to a dark gray-blue.

In general, there are, according to Holmes, two kinds of cells in the amphibian adrenal glands: epithelium cells which are "cortical", are derived from the peritoneum, and chromaffine cells which are "central cells", and regarded by Marshall, as modifications of cells of the sympathetic ganglia. However, in some few species a third kind of cell is found. These are large spherical cells which have a large stainable nucleus and are the "summer cells" of Stilling or the "acidophilous cells" of Patzelt and Kubik.

The results of this study are given as follows:

Rana clamata: Three kinds of cells were distinguished. The acidophilous cells appeared to be greatly in excess of the other cells and were very large, being about 15 μ. The lipoid cells were comparatively small, with small nuclei, and scattered thruout the tissue. The chromaffine cells were arranged in definite patches and appeared about the size of the acidophilous cells.

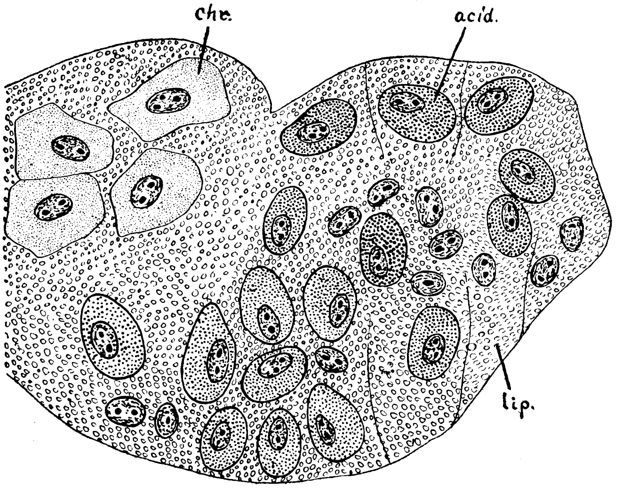

Fig. 1. Adrenal gland of *Rana clamata*

Rana pipiens: As in the case of *Rana clamata,* three kinds of cells were distinguished. The acidophilous cells were less numerous and smaller, being about 10 μ. The chromaffine cells were more scattered and the nuclei of the lipoid cells were much larger than in the former case.

Acris gryllus: Only two kinds of cells were found in this species. The chromaffine cells were quite numerous and large. The lipoid cells were quite a little larger and the nuclei smaller than in the cases of the two frogs given above. No acidophilous cells were found.

Plethodon glutinosus: In this species the lipoid cells are much larger than in any of the other examples, being in some cases 72.5 μ. They are decidedly columnar in shape with large nuclei. The chromaffine cells are not so prominent and the acidophilous cells are lacking.

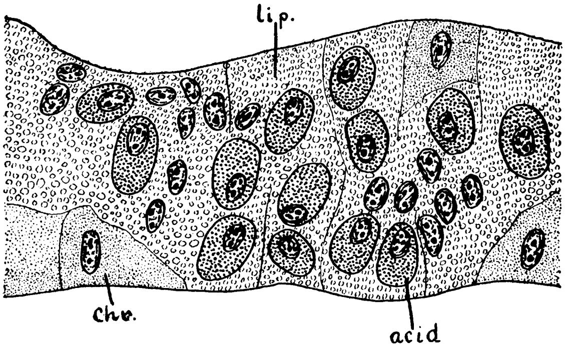

Fig. 2. Adrenal gland of *Rana pipiens*

Spelerpes bilineatus: No acidophilous cells were found in this species. The chromaffine cells were not so large as in the case of the other Amphibians and the cell walls of both these and the lipoid cells stained poorly.

The following conclusions might be made from the observations:

1. As reported by Patzelt and Kubik, in the case of *Rana esculenta,* there appear in the adrenal glands of *Rana pipiens* and *Rana clamata,* two kinds of cells. An epithelial portion composed of the common lipoid-containing cells and among them large granular acidophilous cells, and secondly a chromaffine portion.

2. Acidophilous cells appear in the adrenals of these species all the year round, and should not be called "summer cells" as named by Stilling.

3. In addition to those Anura and Urodeles named by Patzelt and Kubik, there are no acidophilous cells in the adrenals of *Spelerpes bilineatus, Plethodon glutinosus* and *Acris gryllus.*

4. The presence of acidophilous cells in the adrenals of *R. esculenta, R. pipiens* and *R. clamata* suggests that probably these species are more nearly related to each other than they are to other amphibians which do not have the acidophilous cells in the adrenals. It further suggests that certain physiological activities of these three species are very similar if not exactly alike.

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June 12, 1914.

TECHNIC FOR CESTODES

LaRue (Ill. Biol. Monog. Vol. 1: Nos. 1 and 2, 1915) gives the following account of methods of treating Cestodes:

The following methods have been used by the writer in the work on this group of cestodes. To a large extent they may be used with success on all groups of cestodes, although it should be understood that certain methods which give admirable results with the relatively small and thin cestodes here dealt with will not give equally good results if used on the large forms such as Tænia.

The larger forms were picked out of the intestinal contents, care being taken to free the head if the worm was attached to the mucosa. These were then repeatedly dipped in the killing solution until the worm ceased to contract. The worm was allowed to lie for 15 minutes to 2 hours in the same fluid. Metallic instruments are to be avoided if corrosive sublimate solutions are used for fix-